

How do Math Teachers' Circles affect teachers? Themes from teacher surveys

Diana White

University of Colorado Denver

Brianna Donaldson

American Institute of Mathematics

Introduction

- Math Teachers' Circles (MTCs) have been around since 2006, but little is known about their effects
- Growing community of people interested in researching MTCs
- Beginnings of quantitative and qualitative evidence about how MTCs affect teachers

National Survey: Fall 2010

- Format:
 - Modeled on Student Assessment of their Learning Gains (SALG) survey (Seymour et al., 2000)
 - Ratings from 1 (no gain) to 5 (great gain)
 - Open-ended items
 - Teachers asked to rate their gains in:
 - mathematical content knowledge
 - attitudes and dispositions toward mathematics
 - classroom instructional practices
 - professional activities

National Survey: Fall 2010

- Participants: 169 teachers from 13 MTCs
 - 80% had at least 5 years of teaching experience
 - Most (59%) had participated in MTC for at least one full year
 - Most taught in urban (43%) or suburban (29%) settings
 - 38% taught in high-needs schools

Mathematical Content Knowledge

- Over 75% of respondents reported at least moderate gains in their
 - Overall content knowledge of mathematics
 - Mathematical problem-solving skills
 - Understanding of various problem-solving strategies
 - Understanding of connections between areas of mathematics
- Approximately 60% reported good or great gains in these areas

Mathematical Content Knowledge

- “I feel like the Math Teachers’ Circles have given me the opportunity to see a bigger picture in mathematics.”
- “The logic and order that mathematics creates seems to become more clear the deeper we explore.”

Attitudes about Mathematics

- Over 80% of respondents reported at least moderate gains in their
 - Enthusiasm for mathematics
 - Interest in discussing mathematics with colleagues
 - Interest in discussing mathematics with professional mathematicians
- Over a third reported GREAT gains in these areas

Attitudes about Mathematics

- “My confidence with problem solving has increased a lot. I realize that just because I don't totally know a topic in math, I can still look at a problem and try to break it down to solve it. I'm not as intimidated. Also, being able to look at problems in this way enables me to be more likely to discuss the problem with other teachers or mathematicians who may suggest ways to solve the problem.”

Attitudes about Mathematics

- Half of respondents reported good or great gains in the likelihood of their working on mathematical problems during their spare time
 - “I've become much more of a recreational problem solver—I always have my problem notebook with me for ‘down times.’”

Attitudes about Mathematics

- A recurrent comment was that MTC had enabled teachers to see themselves as mathematicians
 - “You encouraged me as a mathematician. I have never actually seen myself as one before.”

Instructional Practices

- 65-70% of respondents reported at least moderate gains in
 - Classroom time spent on problem solving
 - Time spent letting students work together on mathematically rich problems
 - Exploring student questions
 - Helping students understand general strategies for solving problems
- About 40% reported good or great gains in these areas

Instructional Practices

- Teachers often commented on their belief that changing their own attitudes and understanding changed their teaching

Instructional Practices

- “While I understood math algorithms very well, my understanding of why and how the algorithms work has increased. I also look for more than one way to solve problems and ask my students to do the same. I believe I have become a better teacher of mathematics as a result.”
- “I'm much more comfortable not knowing how to do something that a student brings up. By expanding my horizons of the scope of mathematics, I'm much more comfortable in not knowing one of them.”
- “Math Teachers' Circle activities reinforce my feeling of math as a creative endeavor. I try to pass this attitude on to my students.”

Instructional Practices

- Teachers also cited specific ways in which they believe their classroom practice has changed as a result of participating in MTC, such as:
 - Using more student-centered approaches
 - Providing more opportunities for problem solving
 - Introducing more challenging problems
 - Increasing their expectations for ALL students

Instructional Practices

- “My classroom teaching has become more student-centered and engaging. Students are working together and discussing problems in groups, or exploring individually before sharing with a larger group.”
- “I have increased my level of expectations for all students. I incorporate more problems into the weekly homework and we discuss them in class. I used to have more difficulty finding times and places to incorporate problem solving strategies. Now it is becoming part of the routine.”

Instructional Practices

- “As a teacher I tell students that I don't have an answer key and we as a class have to decide if we solved a problem and whether our solution is reasonable. It is getting my students to understand the problem solving process and be able to reflect on their thinking and justify their solution. It has helped build a community of problem solvers in the classroom.”

Professional Activities

- Throughout the survey, teachers cited the professional community created by MTCs as a valuable aspect of their participation
 - “I feel that working on mathematics with my colleagues gives me a wider perspective on how to view mathematics and what it means to teach mathematics.”
 - “I am inspired by a group of people who just want to get together and talk about math. I am not usually surrounded by people like that.”

Professional Activities

- Some respondents also described an increased level of engagement in the profession:
 - “Participating in the MTC meetings has encouraged me to network with others and attend conferences with them.”
 - “It has given me the confidence to step into more of a leadership role and a role in developing curriculum and lesson plans.”
 - “I have started giving presentations at meetings and conferences, have become the mentor for new math teachers, and am peer reviewer of math activities for the classroom at my level for the region.”

Conclusions

- Teachers report that MTCs have positive effects on their mathematical content knowledge, attitudes about mathematics, instructional practices, and professional activities, in ways that are sometimes surprising
- Self-report data open the door to more systematic future investigations

Thank you!

Diana White: diana.white@ucdenver.edu

Brianna Donaldson: brianna@aimath.org